

## ODONATA FROM CARNARVON GORGE, QUEENSLAND

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### Abstract

Twenty seven species of Odonata are known from Carnarvon Gorge, eight Zygoptera and 19 Anisoptera; they constitute an outlier of the fauna of south-eastern Queensland and north-eastern New South Wales. Fourteen species are stream dwellers, and all but one of these have southern affinities. The gorge is the northernmost known locality of two of these southern species. Six species occur in the tributaries but not in the main gorge; two of these are known only from the Carnarvon Gorge area, and the other four show minor differences from their counterparts elsewhere in Australia.

### Introduction

Carnarvon Gorge lies on Carnarvon Creek, a permanently flowing headwater of the Mackenzie River, which joins the Fitzroy River in central Queensland. At approximately 25°S, 148°E, it is some 130 km west of the inland border of the well-watered, montane region of south-eastern Queensland, as defined by Watson (1974), well into southern inland Queensland. Watson (1974) noted that an outlier of the south-eastern Queensland odonate fauna occurs at the Gorge, and excluded those south-eastern species from the faunal list for the more inland region. However, it was then clear that Carnarvon Gorge would repay further study.

The opportunity was therefore taken in December, 1976, to visit the Gorge, and G. Theischinger with L. Müller, of Sydney, spent the first three days of the month collecting adults and exuviae along the main gorge and some of the tributaries. An account of one species has already appeared (Theischinger, 1977) and another will be described elsewhere, in a paper on the Australian brachytronine aeshnids (Theischinger, in preparation). In this paper we discuss the fauna, and its affinities.

### The fauna

Altogether, 27 species of Odonata were collected, eight Zygoptera and 19 Anisoptera; they are listed in Table 1, which also indicates their distributions in the Gorge area. Undescribed species are listed under the initial letter of their manuscript name, as in Watson (1974) or Theischinger (in preparation). It is most unlikely that this total is complete; at least a dozen other species might be expected to occur at the Gorge, to judge from their known distributions elsewhere in Australia (*cf.* Watson, 1974), but the species that were collected constitute an extremely interesting assemblage.

Two of the species were unknown previously, *Austroaeschna* sp. "m" and *Eusynthemis deniseae*; they appeared to be confined to the ravines of tributaries of Carnarvon Creek, and there they were the predominant dragonflies. The closest relative of *Austroaeschna* sp. "m" is *Austroaeschna pulchra* Tillyard [= *A. unicornis* (Martin) of recent authors] (Theischinger, in preparation), but *E. deniseae* shows almost equal affinities with the four other known species of *Eusynthemis* (Theischinger, 1977).

The other four of the six species found only along the tributary creeks all show minor differences from populations elsewhere. Pale markings on the end of the abdomen of most of the species occurring in the dark ravines are more extensive. Specimens of the three damselflies, *Argiolestes icteromelas*, *Episynlestes albicauda*, and *Synlestes tillyardi*, are larger than material from other localities. The *A. icteromelas* are larger than those from the high country of New England, described by Tillyard (1913a) as *A. icteromelas nobilis*. Males from Carnarvon Gorge had hindwings measuring from 32.0 - 32.9 mm, and females 33.7 - 34.2 mm; three male paralectotypes of *A. icteromelas nobilis* from Ebor and Dorriggo, now in the ANIC, measured 29.9 - 31.7 mm; and other material of *A. icteromelas* from New England and the Granite Belt of south-eastern Queensland, also in the ANIC, had hindwings ranging from 28.3 - 30.6 mm in males, and 29.0 - 31.3 mm in females. The hindwings of male *Episynlestes albicauda* from Carnarvon Gorge measured 30.8 - 33.8 mm, and of females 32.5 - 34.1 mm, compared with 28.1 - 31.5 mm and 29.9 - 33.1 mm in specimens from elsewhere (Watson and Moulds, 1977). The adult *Synlestes tillyardi* appeared similar to southern material in colour pattern, and in the general form of the male superior appendages, but the male hindwings were 32.6 - 33.6 mm long, and the female 35.0 - 35.6 mm, compared with 29.4 - 31.9 mm in a sample of males from the New England Tablelands, and 31.5 - 34.3 mm in a sample of females.

The material of the fourth species, *Eusynthemis nigra*, cannot be placed subspecifically, because *E. nigra* appears to change clinally from north to south, rather than to show the discrete differences that Tillyard (1913b) used to delimit northern and southern subspecies. The Gorge specimens differ from both northern and southern *E. nigra* in colour pattern, and have a slightly broader frons.

*Austroaeschna unicornis speciosa* [= *A. speciosa* Sjöstedt, and partly *A. longissima* (Martin) of recent authors (Theischinger, in preparation)] apparently differs from the typical form, but resembles series from south-eastern Queensland, at Tamborine Mountain and near Kenilworth. It was found breeding only in larger, deeper pools along the broad, shallow, stony waters in the main gorge, but the adults frequently visited the tributaries.

The remaining 20 species all frequented the main gorge, and none shows differences from its counterparts elsewhere in Australia.

### Zoogeography

The geographical ranges of the Carnarvon Gorge Odonata, except for the two new species, are summarised in Watson (1974, 1977). All occur in south-eastern Queensland; three (*Synlestes tillyardi*, *Diphlebia nymphoides*, and *Austrogomphus* sp. "c") are not known to extend north of south-eastern Queensland; and only one (*Austroaeschna unicornis speciosa*) is not known from northeastern New South Wales (Watson, 1974, 1977; Theischinger, in preparation).

At least 11, and probably 13, of the 25 Gorge species known from elsewhere have wide ranges not closely related to the streams of the coastal

TABLE 1. Distribution of Odonata in the Carnarvon Gorge area.

species	representation			
	main larvae	gorge adults	tributaries larvae	adults
Suborder ZYGOPTERA				
COENAGRIONIDAE				
<i>Austroagrion cyane</i> (Selys)		*		
<i>Pseudagrion ignifer</i> Tillyard		*		
<i>P. microcephalum</i> (Rambur)		*		
MEGAPODAGRIONIDAE				
<i>Argiolestes icteromelas</i> Selys			*	*
LESTIDAE				
<i>Austrolestes leda</i> (Selys)		*		
CHLOROLESTIDAE				
<i>Episynlestes albicauda</i> (Tillyard)			*	*
<i>Synlestes tillyardi</i> Fraser			*	*
AMPHIPTERYGIDAE				
<i>Diphlebia nymphoides</i> (Selys)		*		
Suborder ANISOPTERA				
GOMPHIDAE				
<i>Austrogomphus amphicyltus</i> (Selys)		*		
<i>Austrogomphus</i> sp. "c"		*		
<i>Hemigomphus gouldii</i> (Selys)		*		
AESHNIDAE				
<i>Aeshna brevistyla</i> Rambur		*		
<i>Austroaeschna</i> sp. "m"			*	*
<i>A. unicornis speciosa</i> Sjöstedt	*	*		*
<i>Hemianax papuensis</i> (Burmeister)		*		
SYNTHEMISTIDAE				
<i>Choristhemis flavoterminalata</i> (Martin)		*		
<i>Eusynthemis deniseae</i> Theischinger			*	*
<i>E. nigra</i> (Tillyard)			*	*
CORDULIIDAE				
<i>Austrocordulia refracta</i> Tillyard	*			
<i>Hemicordulia australiae</i> (Rambur)		*		
<i>H. tau</i> Selys		*		
LIBELLULIDAE				
<i>Diplacodes bipunctata</i> (Brauer)		*		
<i>D. haematodes</i> (Burmeister)		*		
<i>Nannophlebia risi</i> Tillyard		*		
<i>Orithetrum caledonicum</i> (Brauer)		*		
<i>O. sabina</i> (Drury)		*		
<i>O. villosovittatum</i> (Brauer)		*		

and montane corridor of eastern Australia. These include *Austroagrion cyane*, the species of *Pseudagrion*, *Austrolestes leda*, *Aeshna brevistyla*, *Hemianax papuensis*, and the species of *Hemicordulia*, *Diplacodes*, and *Orthetrum*.

The remaining 12 species (*Argiolestes icteromelas*, the chlorolestids, *Diphlebia nymphoides*, the gomphids, *Austroaeshna unicornis*, *Choristhemis flavoterminalis*, *Eusynthemis nigra*, *Austrocordulia refracta* and *Nannophlebia risi*) have coastal ranges linked to permanent flowing water; the two new species have similar habitats. The zoogeographic affinities of these 14 stream dwellers are overwhelmingly southern, as are those of other stream frequenting Odonata in eastern Australia (Watson, 1979). Only *Nannophlebia risi* represents a northern group; the chlorolestids, gomphids, *Austroaeshna* and *Austrocordulia* all appear to have southern continental links (Watson, 1979). It is also worth noting that Carnarvon Gorge is the northernmost locality from which *Synlestes tillyardi* and *Diphlebia nymphoides* have been recorded (Watson, unpublished data; W. E. Stewart, personal communication).

### Discussion

Although the odonate fauna of Carnarvon Gorge is meagre in comparison with the 116 species of Odonata known from south-eastern Queensland, it must be regarded as an outlier of the south-eastern Queensland fauna, presumably a relict. It is possible, but perhaps unlikely, that the two species known only from the Gorge are endemics; if so, it could imply that isolation has been prolonged. Certainly, the differences between dragonflies collected along the tributaries of the Gorge and individuals of those same species from elsewhere suggest that isolation has been long enough for incipient speciation to have occurred.

The findings at Carnarvon Gorge emphasise the need to study Odonata at other localities that may support outliers of the coastal fauna; the Blackdown Tableland in the Expedition Range, where populations of large *Argiolestes icteromelas* occur, is an obvious choice.

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